

PLATE 17.

M. Stebbingi, Green, and *Vedalia Guerinii*, Crotch.

- Fig. 1. Sâl-branch with fully mature ♀ scales feeding (from a drawing by Author).
2. Larva of *Vedalia Guerinii*, dorsal view.
 3. " " " side view.
 4. Sâl-twig with (a) pupating larva, (b) sessile pupa, upon it.
 5. Pupa of *V. Guerinii*, sessile, upon a Sâl-leaf.
 6. Beetle.
 7. *Vedalia* larva attacking ♀ *Monophlebus*-scale.
 8. Sâl-twig with (a) *Vedalia* pupal skin after having been attacked by *Vedalia* larva, (b) larval skin after attacks of parasites.
 9. *Vedalia* beetle attacking ♀ *Monophlebus*-scale.

PLATE 18.

Upper portion of a Sâl (*Shorea robusta*) sapling, showing the attacks of *Monophlebus Stebbingi*, Green (below), and of the larvæ of *Boarmia selenaria*, Hübn. (above). From a photograph by Mr. R. C. Milward, I.F.S.

NOTE.—Small numbers against the figures give the enlargement. Unfortunately all the Plates, in reproduction, had to be reduced by about $\frac{1}{5}$ th. This reduction will therefore have to be allowed for to obtain the true sizes of the figures shown.

Bryozoa from Franz-Josef Land, collected by the Jackson-Harmsworth Expedition, 1896-1897.*—Part II. Cyclostomata, Ctenostomata, and Endoprocta. By ARTHUR W. M. WATERS, F.L.S.

[Read 17th March, 1904.]

(PLATES 19-21.)

THE Cyclostomata are, on the whole, unreliable guides in questions of geographical distribution, for, as we all must recognize, the classification of this suborder is unsatisfactory, although in course of time the examination of the anatomy of the living forms may lead to a natural classification being established. The uncertainty concerning the classification of the Cyclo-

* Continued from Vol. xxviii. p. 105.

stomata arises, in the first place, from the small number of readily available characters, but some of the confusion results from the fact that so many attempts at classification have been based upon fossils; and here almost valueless characters have been used, in consequence of which very exaggerated ideas as to the number of Cretaceous and other fossil Cyclostomata have been received.

Formerly, in the Chilostomata generic divisions were based upon the zoarial form, but now the zoœcial characters are known to be of chief importance, and the zoarial shape is hardly ever of more than specific value, though there may be exceptions, such as the Catenicellidæ. On the other hand, in the Cyclostomata a large number of species and genera have been, and are still, based entirely upon the shape of the zoarium; and until other characters have been made available these groupings must continue to be used, to enable us to record what has been met with, even though these may be catalogue genera and not natural genera.

The number of characters available can be increased; and since Smitt published his papers on the Northern Bryozoa, the importance of the ovicell in the classification of the Cyclostomata has been more fully recognized. Smitt was, moreover, the first who gave a number of figures of ovicells of Cyclostomatous Bryozoa. In my papers I have always referred to the ovicells where there was suitable material, and have dealt with some in two communications*, and since then Dr. S. F. Harmer has published a most valuable series of papers on the embryos and ovicells of *Crisia* †, *Lichenopora* ‡, and *Tubulipora* §; and it is now fully established that useful classificatory characters are furnished by the position and shape of the ovicell, as well as by the nature of the oœciopore. We must see how far the number of tentacles is of value; then the position and form of the closures || are other useful characters; and there are ovarian and sexual characters which must be examined, such as the size

* "On some Ovicells of Cyclostomatous Bryozoa," Journ. Linn. Soc., Zool. vol. xx. p. 275; and "On the Ovicells of some Lichenoporaë," *op. cit.* p. 280.

† Quart. Journ. Micr. Sci., n. s. vol. xxxii. pp. 127-181, pl. 12.

‡ *Ibid.* vol. xxxix. pp. 71-144, pls. 7-10.

§ *Ibid.* vol. xli. pp. 73-157, pls. 8-10.

|| "Closure of the Cyclostomatous Bryozoa," Journ. Linn. Soc., Zool. vol. xvii. (1884) pp. 400-404, pl. 17.

and number of the embryos and the way in which the embryo is formed. The position in the zoecium from which new zoecia grow will certainly here be of value, just as it is in the Chilostomata; for on this the shape of the colony sometimes depends, and this colonial shape must always receive attention. In many species there are internal denticles having distinct forms.

It is too often forgotten that we cannot be sure of genera until we have established the characters upon which the species are based, and then satisfactory family-groups may be made; but at present the attempts to group into families are often ridiculous.

I have been able to examine the ovicells and embryos of *Diastopora intricaria*, Smitt, and *Hornera lichenoides*, Pontop.; but on the whole the collection did not contain many species with ovicells, or with them in such condition or abundance as to admit of much examination.

Since the first part of this communication was published, in this Journal, the following papers on the Arctic Fauna have appeared:—

Bidenkap, Olaf: "Die Bryozoen von Spitzbergen und König-Karls Land," Fauna Arctica, vol. i. pt. II., 1900. Andersson, K. A.: "Bryozoen während der Schwedische Expedition 1898–1899–1900 gesammelt," Zool. Jahrb. vol. xv. 1902, pp. 537–560, pl. 30. Norman, Canon A. Merle: "Notes on the Natural History of East Finmark—Polyzoa," Ann. & Mag. Nat. Hist. ser. 7, vol. xi. pp. 567–598; vol. xii. pp. 87–128 (1903).

Norman, in his paper, puts my *Schizoporella Harmsworthii* under *Lepralia Smitti*, Kirchenpauer; but I still consider that the name *Harmsworthii* should stand, for though this species has been seen before, it has been described mixed up with other species. Smitt figured under *Escharella Legentilii*, forma *prototypa*, two species; and when Kirchenpauer gave the name *L. Smitti* he referred to all of Smitt's figures 47–52, thus including Smitt's forma *typica*, which belongs to another genus, and is probably *Smittia reticulata*, MacG. Kirchenpauer then refers to Smitt's synonyms, those mentioned being *Smittia reticulata* or closely-allied forms, and says they do not correspond with the *L. Smitti*; but all the same it seems impossible to know what Kirchenpauer had before him, as he gives no description. When describing *S. Harmsworthii* I gave my reasons for the new name, and only referred to Smitt's figures 47–48, as fig. 49

must belong to another species; however, Norman includes figs. 47-49.

The present paper was practically written, and the drawings for the plates prepared, before I commenced the examination and description of the collection from the Antarctic made by the 'Belgica,' but it was kept back for comparisons to be made with the Antarctic fauna. The collection alluded to proved to be a very considerable one, containing 86 Antarctic forms besides a few Subantarctic. Of the Antarctic forms, 57 are considered new; but although the number of new species is so large, many of them are closely allied to known forms from the Southern hemisphere, the greatest resemblance naturally being with Subantarctic and South Temperate forms. No species of the Chilostomata is considered to be identical with Arctic forms.

There are 15 species of Antarctic Cyclostomata, and for the most part they are not satisfactory, as few contain ovicells; but nearly all of them, or close allies, have a very wide range of distribution, and three have been found in the Arctic, but these three may all be considered cosmopolitan.

The Bryozoa, so far as they are known at present, certainly do not seem to give any support to the Bipolar theory; but as I have entered more fully into the geographical distribution in my memoir* on the Antarctic Bryozoa, it is not necessary to deal with it here. I have also in the same work protested against the use that has been made of the term Antarctic, when Subantarctic was meant, for, until the last few years, our knowledge of the Antarctic fauna has been most scanty; nevertheless, long lists of animals have been drawn up and called Antarctic, whereas they really were Subantarctic. By including Subantarctic with Antarctic, the area is made about twice as large as that which we call Arctic. Comparisons thus made have to be set aside, but no doubt before long a complete comparison of the Arctic and Antarctic faunas will be possible, as the various Expeditions may be expected to bring back important collections.

There was only one species of Ctenostomata brought back by the Belgian Expedition; however, it was interesting, as we know so few *Alcyonidia* from the Southern hemisphere, but the species described by me makes the third from the extreme south. They all have numerous tentacles, whereas most of the European ones have only 13-17 tentacles.

* Résultats du Voyage du S. Y. 'Belgica' en 1897-1898-1899: Bryozoa, 1904.

1. *CRISIA CORNUTA*, var. *GENICULATA*, *M.-Edw.*

Crisia cornuta, var. *geniculata*, Hincks, Brit. Mar. Polyzoa, p. 419, pl. lvi. fig. 44.

All the specimens of *Crisia* from Franz-Josef Land are only fragmentary, and are without ovicells, so that we can add nothing to our knowledge of the genus, but only record the localities.

There has been a doubt whether *geniculata* should be considered as a variety or as belonging to another genus (*Crisidia*), for in *C. cornuta* the spines are not found to all the zoëcia—in some cases to very few. Harmer* however considers, from differences in the ovicell, that *C. cornuta* and *C. geniculata* should be specifically separated. In Smitt's and other works the locality for the two varieties is not given separately, and therefore a full list of the distribution cannot be made, but I do not find that this variety has been recorded from Arctic seas.

Loc. British. Naples.

Jackson-Harmsworth Exp.: Lat. 77° 55' N., long. 55° 25' E., 115 fath.

2. *CRISIA EBURNEO-DENTICULATA*, *Smitt, MSS.*

Crisia eburnea, var., Smitt, Öfvers. Vet.-Ak. Förh. 1865, p. 142, pl. 16. fig. 9.

Crisia eburneo-denticulata, Busk, Brit. Mus. Cat. Mar. Polyzoa, pt. III. p. 5, pl. 6; Vigelius, "Cat. of Polyzoa coll. during Cruises of the Willem Barents," Niederl. Archiv. f. Zool., Suppl. p. 4.

Although there are no ovicells, I think there can be no doubt that the specimens belong to the species described by Busk. The zoarium is narrow, the zoëcia from the two sides being very close together without an intermediate space; there are about 11–17 zoëcia to an internode; the joints are light; the free end of the zoëcia is short, and the branches start from the lower zoëcia.

Loc. Spitzbergen, 70–90 fath.; Barents Sea, 150 fath.

Jackson-Harmsworth Exp.: Lat. 77° 55' N., long. 5° 20' E., 130 fath.; 50 miles N.W. of Cape Mary Harmsworth, 234 fath.

3. *CRISIA EBURNEA* (*Linn.*).

There are a few fragments from Günther Sound which seem to be the lower joints of this species. There are about six

* Harmer, "On the British Species of *Crisia*," Quart. Journ. Micr. Sci., n. s. vol. xxxii. p. 170.

zoœcia to an internode, with fresh branches given off from about the second zoœcium.

IDMONEA.

Gregory, in his 'Catalogue of Cretaceous Bryozoa,' p. 150, would do away with *Idmonea* as we now understand it, and would restrict it to "Idmoneidæ with the zoarium adnate." He does this taking *I. triquetra*, Lamx., as the type, which is stated by Gregory to be adnate. Lamouroux's figures in 'Exposition Méthodique des Polypiers,' pl. 79. figs. 13 & 14, however, seem to be drawn from an erect species; and in his description of the genus *Idmonea* Lamouroux says: "altera facie subcanaliculata," showing that he had before him a free zoarium, and no doubt most, if not all, workers have taken the description as referring to an erect form.

4. IDMONEA ATLANTICA, Forbes. (Pl. 21. figs. 2, 3.)

Idmonea atlantica, Smitt, "Krit. Fört.," Öfvers. Vet.-Ak. Förh. 1866, pp. 399 & 434, pl. 4. figs. 5-9; Hincks, Brit. Mar. Polyzoa, p. 451, pl. 65. figs. 1-4; MacGillivray, Tert. Polyzoa Victoria, p. 122, pl. 16. fig. 17, pl. 17. fig. 8; Bidekap, "Bry. Spitzbergen," Fauna Arctica, vol. i. p. 527; Waters, Résultats du Voyage du S. Y. 'Belgica': Bryozoa, p. 90, pl. 9. fig. 5.

For other synonyms Miss Jelly's Catalogue may be consulted; but I feel considerable doubt as to whether the name has always been correctly applied, and although we call it Forbes's species there is uncertainty as to any determinations previous to Smitt, and perhaps he would have done better by giving it a new name. The branching is much less frequent than is shown in Johnston's figure, and the dorsal surface is usually concave, though it is sometimes convex as described by Johnston. The colonies grow to a considerable size, evidently two or three inches in height. There are usually three zoœcia in a series, which are about 0.9 mm. to 0.1 mm. apart, and the closure occurs at a short distance from the base of the erect portion. The bifurcation is nearly always a broad distinct curve, as figured by Smitt; then the branches run nearly parallel. The aperture of the zoœcia is about 0.15 mm. wide. Unfortunately both Busk and Hincks fail to give the magnification of their figures, so that no comparison of size can be made.

In the specimens from Franz-Josef Land the ovicell does not

occur at a bifurcation, but is a central inflation, involving one or two series of zoecia. In most of the few ovicells found the ovicellular duct cannot be distinguished; but in one, though somewhat broken down, it is seen as a narrow opening close up to the zoecial tube. Busk figures the ovicell in his British Museum Catalogue, but does not refer to it, whereas Hincks describes but does not figure it. Smitt figures an ovicell at a bifurcation, but as his figure relates to an "Alecto stadium," we cannot be sure whether he has seen the ovicell of *I. atlantica*, nor can we be sure of the localities from which he obtained his *I. atlantica*.

A more delicate form has been described as var. *tenuis*, and it is not always certain whether the variety is referred to. The 'Challenger' specimen from Simon's Bay is more delicate than the common Arctic form.

Loc. Spitzbergen (*Bidenkap*); Barents Sea; Kara Sea; Jan Mayen, 15-180 metres; Scandinavia; Greenland; Finland; Novaya Zemlya; British coasts; Florida; Japan, 200 fath.; and Busk, in the 'Challenger' Report, gives Nightingale Island; Kerguelen; Cape of Good Hope; Cape Horn Exp.: Station unknown (*Waters*), Antarctic, lat. 70° S., long. 80° 48' W., 500(?) fathoms.

Jackson-Harmsworth Exp.: Lat. 77° 55' N., long. 53° 20' E., 130 fath., and lat. 77° 55' N., long. 53° 16' E., 130 fath.; 50 miles N.W. of Cape Mary Harmsworth, 53-93 fath. and 234 fath.

5. IDMONEA FENESTRATA, *Busk*.

Tubulipora fenestrata, Smitt, "Krit. Fört." 1866, p. 399.

Idmonea fenestrata, *Bidenkap*, "Bry. Spitzbergen," Fauna Arctica, vol. i. p. 528.

There is a worn specimen which I think is the species referred to by Smitt. It is a stout form, frequently branching, with the solid dorsal part much wider than the front, and with wide lines on the dorsal surface. Three or more zoecia to a series, which are confined to the front part of the zoarium.

A question has been raised as to whether the *I. fenestrata* of Busk and of Smitt are identical.

Loc. Spitzbergen (*Smitt*; and *Bidenkap*, 100 metres).

Jackson-Harmsworth Exp.: Lat. 77° 55' N., long. 53° 16' E., 130 fathoms.

6. *IDMONEA TUMIDA* (Smitt). (Pl. 21. figs. 4, 5.)

Tubulipora (*Idmonea*) *tumida*, Smitt, "Krit. Fört." 1871, p. 1119, pl. 20. fig. 7.

Idmonea atlantica, var. *tenuis*, Busk, Rep. Brit. Assoc. 1859, p. 146.

There is one specimen from Franz-Josef Land which is about 20 mm. long, but it is broken at each end; about 5 mm. from the lower end of the piece it divides into branches, dividing again after about 19 mm. The branches do not spread out widely, in this respect resembling *I. atlantica*, Forbes; they are about 0.6 mm. wide, and the series are about 0.7 mm. apart, while the zoëcia are about 0.1 mm. internal diameter. It will be seen that the branches are much narrower than those referred to under *I. atlantica*, Forbes, and the series are much closer together.

The *I. atlantica*, var. *tenuis*, Busk, has not been figured or fully described; but in all probability this is the species that has been frequently alluded to as var. *tenuis*, though, as the zoëcia are so much narrower, it would seem correct to consider it a separate species.

Loc. Smeerenberg, Spitzbergen (Smitt).

Jackson-Harmsworth Exp.: Lat. 77° 55' N., long. 53° 16' E., 130 fathoms.

7. *HORNERA LICHENOIDES* (Pontop.). (Pl. 20. figs. 1-6.)

Besides the references given in Miss Jelly's Catalogue, see Bidentkap, "Bryozoen von Ost-Spitzbergen," Zool. Jahrb. vol. x. 1897, p. 632, pl. 25. fig. 4; id. Lyngenfjordens Evertebratfauna, 1899, p. 94; id. "Bry. von Spitzbergen und König-Karls Land," Fauna Arctica, vol. i. pt. iii. p. 529; Nordgaard, "Die Bry. des West Norwegens," Meeres-Fauna von Bergens, p. 100; Gregory, J. W., The Cretaceous Bryozoa, vol. i. 1899, p. 361, fig. 44; Andersson, K. A., "Bry. während der Schwed. Exp. 1898-1900 . . . gesammelt," Zool. Jahrb. vol. xv. pt. ii. p. 551, 1902.

This is an Arctic form which Busk gives as off Monte Video ('Challenger'), and Kirkpatrick as from Port Phillip, and it has been stated to have been found in the Antarctic*; but I have in various places stated that there is reason for considering that a mistake in labelling has been made. A closely-allied species, however, occurs in the Antarctic, which I have named *H. antarctica*, Wat. Miss Jelly gives *H. ramosa*, MacG. †, as a

* To this specimen, reported to have been brought back by the 'Erebus' and 'Terror,' I have already referred, Journ. Linn. Soc., Zool. vol. xxviii. (1900) p. 62.

† MacGillivray, "Description of New or Little-known Polyzoa," pt. xii., Trans. Roy. Soc. Vict. 1886, p. 3, pl. 1. fig. 4.

synonym, but from the description that seems to be a much smaller and more delicate species. However, as *Reteporidea ramosa*, d'Orb., is *Hornera*, MacGillivray's species cannot stand.

A specimen from Naples is very much like the *H. lichenoides*, having similar dorsal ovicells, and has been called *H. lichenoides*; but I propose to separate it as *H. mediterranea*. It has the zoëcia irregularly placed; the outer zoëcia are much the longest, the inner ones are not much raised, and the border is entire. It may be the *H. serrata* of Meneghini, but the name *serrata* has been previously employed by Reuss. *H. borealis*, Busk, from Shetland, has been frequently placed as a synonym of *H. lichenoides*, Pontop.; but I am not confident that this is the case, as I find in an authentic specimen sent to me so named by Canon Norman that the zoëcia are smaller, measuring internally about 0.08 mm., and they are more abundant than in the Arctic *H. lichenoides*. A considerable number of specimens should be examined to see what is the range of variation.

The dorsal position of the ovicell obtains in but few genera, and therefore the comparison with other Cyclostomata has a special importance, as it cannot arise through a slight modification of a zoëcium, though there must at some time have been a communication with a zoëcium; and the adaptive changes must have been much greater than in such genera as *Crisia* and *Idmonea*.

A comparison with the ovaria of *Diastopora intricaria*, Smitt, already described, shows some important differences. In that species we have seen that the number of embryos in an ovicell is very large, being over one hundred, whereas in the ovicell of *H. lichenoides* it would not seem, from my sections, to exceed about ten, and these are much larger than those of *Diastopora intricaria*, probably about four times as large, and these last are much further developed. Ostroumoff* says that the larvæ of *Hornera* are the largest of the marine Ectoproct Bryozoa with which he is acquainted, measuring 0.48 mm., and that in size downwards are *Hornera*, *Tubulipora*, *Fron dipora*, *Discoporella*, and *Crisia*, which last are only 0.07 mm. The protoplasmic reticulum is attached to the wall of the ovicell, and not only surrounds the group of larvæ but passes between the individuals,

* "Zur Entwicklungsgeschichte der Cyclostomen Seebryozoen," Mittheil. Zool. Station zu Neapel, vol. vii. p. 180.

and in this protoplasmic reticulum there are a number of large isolated cells, suggestive of ovarian cells; but at first I could not find proof of this, though ultimately some groups of these cells were found so closely resembling the ovaria of various Bryozoa as to leave no doubt that we have here ovaria formed in or on the border of the protoplasmic reticulum.

In the Chilostomatous Bryozoa the position of the ovaria differs according to the species, and the position may often turn out to be a specific character of some importance: sometimes it is at the side of the zoëcium, sometimes, in fact frequently, it is close to the base of the cæcum, but in all cases attached to the parenchym-tissue. The protoplasmic network spreads to all parts of the zoëcium, but is usually abundant at the base of the cæcum, so that some authors have spoken of a funiculus where it does not exist. Figures are given, for comparison, of an *Aleyonidium* (Pl. 20. figs. 8, 9, 10) in which the ovarium occurs close to the cæcum, and grows within a separate protoplasmic network, with large nucleated ova (see p. 180).

It would thus seem as if, while the differences are very great, there are some points of comparison between the formation of the ovarium within the ovicell of *H. lichenoides* and within the zoëcium of some Chilostomata and Ctenostomata; but there are important questions which my sections do not answer:—Are the ova fertilized by the spermatozoa within the ovicell? and in what way is there a connection between the originating zoëcium and the ovicell?

Until more sections have been made it must remain an open question, whether this continuous growth of ovarian cells within the protoplasmic network is supplementary to “embryonic fission,” or in what way it is related to it, for it does not seem to me to entirely fall in with the description given by Harmer*.

The calcareous wall of the ovicell is formed by thin vertical bars between the outer and inner surfaces, enclosing spaces; but, being rather fragile, it is difficult to make sections. The figures given by Smitt of the dorsal surface of *H. lichenoides* are very characteristic, but in dried or incinerated specimens the rows of

* Harmer says:—“The primary embryo consists of a mass of embryonic cells (or rather, nuclei imbedded in continuous protoplasm) which are obscurely differentiated into outer and inner cells (or nuclei). The whole function of this embryo is to act as an embryogenic organ, or producer of secondary embryos.”—Quart. Journ. Micr. Sci. n. s. vol. xxxiv. p. 209.

tubular pores do not appear as regular, and then the ridges are seen between the pores. There are 9 tentacles.

Loc. Very general from the Arctic Regions, also from off the British coast. Busk, in his 'Challenger' Report, gives *Hornera lichenoides* from off the Argentine; Kirkpatrick mentions it from Port Phillip, and Whiteaves from the St. Lawrence.

Fossil. From the Crag; Victoria (*MacGillivray*); Calabria, Post-Pliocene (*Neviniani*).

Jackson-Harmsworth Exp.: Lat. 77° 55' N., long. 55° 25' E., 115 fath., and lat. 77° 55' N., long. 55° 16' E., 130 fath.; off glacier between Cape Flora and Cape Gertrude, 30 fath.; 50 miles N.W. of Cape Mary Harmsworth, 234 fath.

S. DIASTOPORA OBELIA, var. ARCTICA, nom. nov. (Pl. 21. fig. 1.)

Diastopora hyalina, forma *obelias*, Smitt, "Krit. Fört." 1866, pp. 396 & 421, pl. 8. fig. 8.

The characters of the Franz-Josef Land specimens are well represented by Smitt's figure, in which the position of the adventitious tubule is different from that of the British and Mediterranean *D. obelia*, Johnst.

There are large zoëcia the ends of which are erect, and by the side of these is a narrow adventitious tubule, which is the termination of a fairly wide horizontal or erect tube, about half the width of a zoëcium. In the British and Mediterranean *D. obelia*, the tubule is in a line below the zoëcial aperture, while in the fossil *D. brendolensis*, Waters, the tubule rises up by the side of a zoëcial tube. It is a question whether the differences mentioned justify the specific separation of the Arctic from the better-known form of *D. obelia*. Smitt and others speak of *D. hyalina*, and *D. hyalina*, forma *obelias*, but from the tables of distribution &c. it is not always possible to know which of the forms is being referred to.

The ovicell extends over the entire distal end of the zoarium, enclosing a very large number of zoëcia (see Pl. 21. fig. 1). Neither in this variety nor in any specimen of *D. obelia* have I found "closures" of any kind, whereas in *D. sarniensis*, Norm., there is a closure with a narrow tube at the end.

There are 10 tentacles in *D. obelia*, from Naples.

The *Proboscina malaccensis*, d'Orb.,* from the Straits of Malacca, No. 13760, Mus. d'Hist. Nat. Paris, is *Diastopora* with

* Paléontologie Française, vol. v. p. 847.

the tubules by the side of the zoëcia opening near the zoëcial aperture, as figured by Smitt ("Krit. Fort." 1866, pl. 8. fig. 11). Not having seen any ovicell, or made any measurements of this specimen, it is better not to definitely decide that it is identical with our Arctic variety, although I am aware of no difference. The specimen is discoid. *Berenicea prominens*, Lamx., is not figured or described by Lamouroux or d'Orbigny as having tubules, but in the Paris Museum d'Orbigny's tube 13770 contains *Diastopora obelia* with tubules and another species without, all labelled *B. prominens*.

Berenicea prominens, Lamx., is Gregory's type of *Berenicea*, but *Berenicea* we can only consider as *Diastopora*; and whether it is the *D. obelia*, Johnst., as stated by Gregory, or another *Diastopora* can never be decided by the description or figures, as these would do equally well for most *Diastopora* and for species in other genera as well. Norman* considers that *Berenicea prominens*, Lamx., is *Chorizopora Brongniarti*, Aud., and certainly Lamouroux's figure could not settle the question as to whether *Diastopora* was intended; but when we examine the other two figures of "*Berenicea*" we can hardly doubt that they are *Diastopora*. We thus have two authorities wishing to overthrow two well-recognized genera, *Diastopora* and *Chorizopora*, one believing that *Berenicea prominens*, Lamx., was *Diastopora obelia*, while the other thinks it was *Chorizopora Brongniarti*, Aud.

Canon Norman is perhaps better acquainted with the older literature of the Bryozoa than anyone else, he is a most careful observer, and is known to possess a splendid collection for reference, and therefore we may say that he has given us a most instructive example of the difficulty of trying to make out what the older authors described. We all have to spend too much time in looking back, to find out what was meant when species were described without any of the characters which are now recognized as of greatest importance being used. We should all be better employed in going forwards.

For the species of *Diastopora* with adventitious tubules it may possibly be advisable ultimately to accept a new genus, but the name *Diplopora* † proposed by Jullien & Calvet has already been

* "Natural History of East Finmark," Ann. Mag. Nat. Hist. ser. 7, vol. xi. p. 569, 1903.

† "Bryozoaires provenant des campagnes de l'Hirondelle," Monaco, 1903, p. 115.

used by MacGillivray, and until more is known about the tubules it would seem better to place both groups with *Diastopora*.

Loc. Wäderöarne, Bohus Bay (*Smitt*).

Jackson-Harmsworth Exp.: two-thirds of a mile S.W. of Elmwood, 18 fath., 26th June, 1897; off Cape Mary Harmsworth, 53-93 fathoms.

9. *DIASTOPORA INTRICARIA* (*Smitt*). (Pl. 19. figs. 1-13.)

Reticulipora intricaria, *Smitt*, Öfvers. Vet.-Ak. Förh. 1871, p. 1117, pl. 20. figs. 1, 2, 3; Nordgaard, O. Mar. Polyzoa, ii. Bergens Museum Aarbog, 1896, p. 5; id. Polyzoa den Norske Nordhavs-Exp. 1876-8, p. 19, pl. 1. fig. 12 (1900); Bidekap, Bry. von Ost-Spitzbergen, Zool. Jahrb. vol. x. 1897, p. 632; "Die Bry. von Spitzbergen und König-Karls Land," ii. Fauna Arctica, p. 528, 1900.

Diastopora intricaria, *Smitt*, *op. cit.* 1878, p. 13; Levinsen, Bry. fra Kara-Havet, Dijnphna-Togtets zool.-bot. Udb. 1886, p. 325.

This seems to be one of the commonest species from off Franz-Josef Land, and from these specimens some additions can be made to *Smitt*'s description. We are, however, at first met with the difficulty as to where it should be placed, for it may be called a bilaminate *Diastopora*, and three names have been given for bilaminate *Diastopora*, namely, *Mesenteripora* (*Blainville*, 1834), *Reticulipora* (*d'Orbigny*, 1847), and *Bidiastopora* (*d'Orbigny*, 1847); but probably all should remain under *Diastopora*, though, should this not be done, then *Mesenteripora* may have to be retained, dropping the others.

However, *Gregory**, for the previously recognized genus *Reticulipora* of *d'Orbigny* creates a new genus *Reticrisina*, but under no circumstances could this new genus be retained. *D'Orbigny* made the genus *Reticulipora* for some Cretaceous species, describing and figuring four species, though, following the rule adopted throughout his work, he first mentioned any species already described which he considered belonged to the genus, usually giving them in the order of, the geological formation to which they belonged, and then he described the new species. In this case *Apsendesia dianthus* of *Blainville* is mentioned first, because it comes from the Bathonian of France, but in my opinion this in no way justifies us in saying that this is the type of the genus, and *Gregory* seems to have misunderstood

* "The Cretaceous Bryozoa," Cat. Foss. Bryozoa in the British Museum vol. i. p. 176.

d'Orbigny when he says "that genus was founded by d'Orbigny in 1849 for the *Apsendesia dianthus* of Blainville, which is a Bathonian species." We now know that d'Orbigny made a mistake in placing the *A. dianthus* under *Reticulipora*, and that it does not at all correspond with his diagnosis of the genus. Taking as the type the species that was first mentioned, because it was geologically the oldest, would add much to the present confusion, as this case demonstrates; for all the *Reticulipora* well described and figured by d'Orbigny are not allowed to remain in his genus, while another species merely mentioned, which does not correspond with his description of the genus, is made the type of *Reticulipora* of Gregory (non d'Orb.); and then in Gregory's Catalogue the *Holostoma contingens*, Lonsdale, is placed under *Reticulipora*.

In *Diastopora* the zoœcial tubes are small, whereas in *Stomatopora* they are usually larger with much thicker walls. It is only in *Diastopora* (used in a wide sense) that the "closure" has a small tubule in the middle; and such closures are now known in *Diastopora sarniensis*, Norm.; *D. concinna*, MacG.; *Reticulipora nammulitorum*, d'Orb.; *R. obliqua*, d'Orb. (Cretaceous); *R. papyracea**, d'Orb. (Cret.); *R. dorsalis*, Waters; *Mesenteripora repens*, Haswell; *Mesenteripora meandrina*, S. Woods; *Diastopora gutta*, Jull. & Calvet.

There are a few species which have "adventitious tubules" (*Bush*) called zoœciules by Jullien, as for example *D. obelia*, Johnst.; *D. intricaria*, Smitt; *D. brendolensis*, Waters; *Diplopore Grimaldi*, Jull. & Calv. The closures of the species of this group, so far as they are known, have numerous perforations (see Pl. 19. fig. 7), and to none of the closures is there a tubule. It is unfortunate that the term tubule has been employed in the same genus for quite different structures.

In *D. intricaria* the adventitious tubules arise from the space formed over the groups of zoœcia by a second calcareous layer, as shown in Pl. 19. figs. 9, 10.

In the adventitious tubules of *D. obelia* there is a protoplasmic† mass, passing through a group of muscles, but this I have not

* This occurs in *R. obliqua*, d'Orb., fossil from Tours and from La Bonneville; and in *R. papyracea*, d'Orb., from La Bonneville.

† Pergens, "Bry. du Crét." Bull. Soc. Belge de Géol. vol. iii. p. 311, fig. 4; Waters, "North Ital. Bry.," Quart. Journ. Geol. Soc. vol. xlviii. p. 155.

been able to see in *D. intricaria*, for the material was not favourable, as in most cases the zoœcia were empty and the zoarium was dead.

The flattened branches (Pl. 19. fig. 2) form an anastomosing network as seen in fig. 1, and evidently the colonies may grow to a considerable size, probably extending to considerably over six inches in length and width. The flattened branches may be considered a series of irregular lobes, with the zoœcia arranged more or less in series, and in some parts the zoœcial tubes are very long, projecting at right angles to a branch (see fig. 5); in other parts the zoœcia do not extend beyond the surface (fig. 8). There are zoœcia on the dorsal (lower) surface of the zoarium (fig. 4). A marked characteristic is the wavy arrangement of the zoœcia, which is well seen in balsam preparations, as well as in sections of the calcareous parts (fig. 13), and such sections show some irregular denticles in the walls.

The ovicells are large and considerably raised (figs. 4 & 6), with the zoœcial tubes in some cases projecting much above the ovicellular wall; in other cases they are at about the level of the wall, as are also the adventitious tubules, while these and the zoœcia both have perforated closures. The ovicellular duct is rather small and does not expand into a funnel, and not more than one has been found to an ovicell. The ovicell, which spreads irregularly between the zoœcial tubes, contains a large number of small embryos; there will usually be more than 100 at the same time (fig. 12).

There are 12 tentacles.

If the broken fragments, from some of the bottles, had been found fossil, they would probably have been arranged under various genera and many species. We have the ends of the branches (Pl. 19. fig. 3), which quite correspond with Cretaceous *Reticulipora*; some of the fragments of the older part of the flat branches resemble in shape the Crag *Mesenteripora*; and again, pieces with prolonged zoœcial tubes (figs. 4, 5) would have been separated from those in which the zoœcia do not project*.

Loc. Spitzbergen (*Nordg. & Biden.*), 65-300 fath. (*Biden.*,

* That we are still only struggling towards a satisfactory classification of the Cyclostomata may be seen from the fact that Pergens in "Tabl. Syn. de la Classification," Rev. des Bry. p. 326, has placed *Diastopora* under the family Diastoporidae, *Reticulipora* under the family Idmoncidae, and *Bidiastopora* and *Mesenteripora* under Entalophoridae.

8-1000 met.); Kara Sea (*Smitt & Levin.*), 35-125 fath.; Finland (*Nordg.*); Ballin's Bay (*Sm.*); Norway (*Sm.*), 200-230 fath.; off Iceland (*Nordg.*); Bear Island (*Nordg.*).

Jackson-Harmsworth Exp.: off glacier between Cape Flora and Cape Gertrude, about 30 fath.; lat. $77^{\circ} 55' N.$, long. $55^{\circ} 25' E.$, 115 fath.; lat. $77^{\circ} 55' N.$, long. $53^{\circ} 20' E.$, 130 fath.; lat. $77^{\circ} 55' N.$, long. $53^{\circ} 16' E.$, 130 fath.; 40-50 miles N.W. of Cape Mary Harmsworth, 234 fath.

10. STOMATOPORA INCRASSATA, *Smitt.*

From off Cape Mary Harmsworth, 53-93 fathoms, there is a small specimen which is apparently *S. incrassata*, Smitt, but the determination of a small fragment is not satisfactory. The zoecia are about 0.18 mm. internal diameter.

Loc. Arctic; British: Queen Charlotte Island; Spitzbergen, to 1000 fathoms (*Biden.*); Antarctic (*Waters*); Gulf of St. Lawrence; New South Wales (*Waters*).

11. STOMATOPORA sp.

I find myself unable to determine this *Stomatopora*, and consider that a large number of the names of Northern *Stomatopora* are only synonyms. There are many specimens from Franz-Josef Land without ovicells, the lobes are wide, the zoarium is flat, and the ends of the large zoecia are but little raised. In zoarial growth it most nearly resembles *Tabulipora lobulata*, Hassall; but why is *T. lobulata*, Hassall, to be generically separated from *Stomatopora expansa*, Hincks, and is not Hincks right in his surmise that this last may be *Proboscina ramosa*, d'Orb.? *Stomatopora diastoporoides*, Hincks, seems to be separated on very slight grounds. This last, Smitt has called *Diastopora diastoporoides*.

The internal measurement of the aperture of the Franz-Josef Land specimens is 0.13 mm.

12. LICHENOPORA VERRUCARIA (*Linn.*).

Discoporella verrucaria, Smitt, "Krit. Fört." Öfvers. Vet.-Ak. Förh. 1866, p. 405, pl. 10. figs. 6-8, pl. 11. figs. 1-6.

A specimen from Günther Sound, growing on *Flustra*, is typical *L. verrucaria* of Smitt, and also from other localities it occurs, though in less satisfactory condition.

The central portion is covered over by a wall, with openings

of very irregular shape and size, as figured by Smitt (pl. 11. fig. 4); through this wall pass the ovicellular ducts with funnel-shaped openings. The zoœcial tubes have the median longitudinal rib well marked, and this usually forms a median acuminate process, though sometimes the two sides are acuminate instead. Typical *Lichenopora verrucaria*, L., occurs from Naples and other Mediterranean localities, though in one form which I at first named *L. verrucaria* the rays are more distinct, and perhaps it is a variety of *L. radiata*, Aud.

Heller, when referring to *Tubulipora verrucaria*, L., gives *Madrepora verrucaria*, Fab., as a synonym, but, judging from the references to Milne-Edwards's and Johnston's figures, it is probable that Heller was describing *Tubulipora flabellaris*, Johnst. He also gives *M. verrucaria*, Fab., as a synonym of his *Discopora hispida*, which may be *Lichenopora hispida*, Flem. *Lichenopora verrucaria*, L., has been very carefully studied by S. F. Harmer, with special reference to the ovicell, and the results are given in his paper "On the Development of *Lichenopora verrucaria*," Quart. Journ. Micr. Sci. n. s. vol. xxxix. p. 71, pls. 7-10. Ridley mentions and figures a closure with a central opening, and thinks that Smitt had mistaken some of these for ovicellular ducts.

Loc. Spitzbergen, 10-65 fath. (*Bid., Nordg.*); Barents Sea (*Vigelius*); Jan Mayen, 160-180 metres; Greenland; Novaya Zemlya, 5-20 fath. (*Sm.*); Kara Sea, 50 metres (*Sm.*); Iceland, 15-20 fath.; Franz-Josef Land, lat. 79° 55' N., long. 51° 0' E. (*Ridley*); Davis Straits; Labrador; Queen Charlotte Islands; Orca, Prince William Sound; Alaska (*Robertson*); British Seas; Naples; Cette, 15-90 metres (*Calvet*); Oran, Algiers (*W.*).

Jackson-Harmsworth Exp.: Günther Sound, 10 fath.; off Elmwood, 18 fath.; off glacier between Cape Flora and Cape Gertrude, about 30 fath.; lat. 77° 55' N., long. 53° 16' E., 130 fath.; Bay W. of Cape Flora, 5 fath.

13. LICHENOPORA CRASSIUSCULA (*Smitt*).

Discoporella crassiuscula, Smitt, "Krit. Fört.," Öfvers. Vet.-Ak. Förh. 1866, pp. 406 & 482, pl. xi. figs. 7-9.

There is a specimen from off Cape Mary Harmsworth which resembles Smitt's figures. It has been suggested by Jullien*

* "Bryozoaire recueillis à Étretat," Bull. Soc. Zool. France, vol. vi. p. 13, 1881.

that Smitt's species is only young colonies of *Lichenopora hispida*, Flem., but this is open to question.

14. *CYLINDRÆCIUM DILATATUM*, *Hincks*.

There are a few zoœcia of a *Cylindræcium*, which I believe is *dilatatum*; but with only a few zoœcia, it is difficult to be quite certain as to the specific determination.

Loc. British and North French coasts; Bohus Sea; Jan Mayen (*Lorenz*).

Jackson-Harmsworth Exp.: Lat. 77° 55' N., long. 53° 16' E., 130 fathoms.

15. *BUSKIA NITENS*, *Alder*.

A few colonies growing on Hydrozoa are not sufficient for detailed examination.

Another species of *Buskia* occurs in the Mediterranean, one has been found in the Mergui Archipelago, and one off Cape Horn.

Loc. Davis Straits, 100 fath. (*Hincks*); White Sea; Barents Sea, lat. 72° 32' N., long. 36° 29' E. (*D'Urban*); Queen Charlotte Island (*H.*); Mediterranean (*H.*).

Jackson-Harmsworth Exp.: off Cape Mary Harmsworth, 53-93 fath., and lat. 77° 55' N., long. 53° 20' E., 130 fath.

ALCYONIDIUM.

The appearance of *Alcyonidium* is so different from that of most of the Bryozoa, that in all probability it has been frequently passed over, and is more widely distributed than the present records would indicate.

From the Southern hemisphere I only find *Alcyonidium* mentioned a few times—namely, *Hincks* gives Natal as a locality for *A. gelatinosum*, L., and the 'Challenger' brought one species also from S. Africa, which *Busk* named *A. flustroides*; *MacGillivray* mentions none from Victoria; but *Kirkpatrick* gives *A. mytili*, *Dalyell*, from Port Phillip, and he also described *A. flabelliforme* from the Antarctic, while I have named an Antarctic species *A. antarctica*.

My own studies are but limited, and from my collection I cannot criticise this genus, but we appear to know:—

ARCTIC:—*A. gelatinosum*, L.; *A. hirsutum*, Flem.; *A. mamillatum*, Ald.; *A. mytili*, *Dalyell*; *A. albidum*, Ald.; *A. corniculatum*,

Sm.; *A. disciforme*, Sm.; *A. disjunctum*, Hincks; *A. lineare*, Hincks; *A. parasiticum*, Flem.

BRITISH. *A. gelatinosum*, L.; *A. hirsutum*, Flem.; *A. mytili*, Dalyell; *A. albidum*, Ald.; *A. excavatum*, Hincks; *A. lineare*, Hincks; *A. parasiticum*, Flem.; *A. polyoum*, Hass.; *A. subviride*, Couch.

MEDITERRANEAN. *A. gelatinosum*, L.; *A. mytili*, Dalyell; *A. duplex*, Prouho.

S. AFRICA. *A. gelatinosum*, L.; *A. flustroides*, Busk.

There has been but little anatomical work done on *Alcyonidium*, but there is one very valuable paper by Prouho, Arch. Zool. exp. ser. 2, vol. x, no. 4, 1892; and Farre, in the 'Philosophical Transactions,' 1837, under the name *Halodactylus*, gives figures of cross sections, but without detail. The zoarial cuticula is very thick, and there is no zoarial wall consisting of large vacuolated cells, as in the Phylactolæmata (see Braem, Davenport, and Kraepelin).

16. *ALCYONIDIUM GELATINOSUM* (Linn.). (Pl. 20. fig. 7, and Pl. 21. figs. 6, 7.)

To the list in Miss Jelly's Catalogue, add:—

Alcyonidium gelatinosum, Hincks, Ann. Mag. Nat. Hist. ser. 5, vol. xiii. p. 207; Levensen, Zool. Danica (Danske Dyr), p. 80, pl. 7. figs. 21–26; Bidekap, "Die Bryozoen von Spitzbergen und König-Karls Land," Fauna Arctica, vol. ii. p. 530, pl. 10. fig. 6; Robertson, "Bryozoa," Harriman Alaska Expedition, Proc. Wash. Acad. Sci. vol. ii. p. 329.

There are some specimens growing from a thin stalk which is about 12 mm. long and 1–2 mm. wide; at the end of this stalk the cylindrical unbranched colony becomes much wider, to about 20 mm., and in one specimen attains a length of about 100 mm. Levensen has figured this form in his 'Danske Dyr,' pl. 7. fig. 21, and it corresponds in shape with Bidekap's figure of *A. hirsutum*, *op. cit.* pl. 10. fig. 5. This group has a white leathery appearance. The other group is frequently branched and lobed, and the specimens never attain to so great a length, being about 25–50 mm. long and about 4–5 mm. in diameter. These specimens look more fleshy and are a dirty grey, and one was figured by Levensen, Danske Dyr, pl. 7. fig. 22. The external cuticula of this form contains a great quantity of imbedded diatoms and other débris, so that it seems as if the colour depends upon this foreign matter, for in the whiter specimens the diatoms are absent. The cuticula surrounding the colony is fairly thick,

whereas the walls separating the zoœcia are quite thin. The minute structure has not been considered sufficient to furnish grounds for separating the two forms.

The Franz-Josef Land specimens have 17 tentacles, which seems to be about the number generally found, though Lamouroux and Fleming, apparently in error, say 12 tentacles, Smitt gives 15-17, Farre 16 or occasionally 15, Hincks 15-17. I have published the number of tentacles of other species, but it may be well to repeat the list here. *A. hirsutum*, Flem., has 15-17 (*Hincks*); *A. mamillatum*, 16-18 (*Hincks*); *A. mytili*, Dalyell, 15-18 (*Hincks*), 19 (*Waters*); *A. parasiticum*, Flem., 15-16 (*Hincks*). So that about 17 may be said to be frequently the number in *Aleyonidium*: but *A. duplex*, Prouho, has 20 tentacles (*Prouho*); *A. polyomum*, Hass., 20 (*Hincks*); *A. Brucei*, Calvet, 16-18 (*Calvet*); *A. cellarioides*, Calvet, 20 (*C.*). *Hincks* gives 18 for *A. albidum*, Alder, whereas Prouho says about 25; *A. variegatum*, Prouho, 28 or more tentacles; *A. flustroides*, Busk, 24-27 (*Waters*); *A. flabelliforme*, Kirkp., 26-28 (*Waters*); *A. antarcticum*, Waters, 24-27. I have sections of a small subglobular specimen from Naples about $\frac{1}{2}$ inch in diameter, growing from a stalk and with a thick cuticula, like *A. gelatinosum*, and in some respects it seems to resemble that species, but it has 24 tentacles.

In sections of specimens of *A. gelatinosum* from off Cape Mary Harmsworth the ovarium (Pl. 20. fig. 7) is surrounded by small nucleated cells forming a wall the thickness of several cells, and within this are the large ova, of which there are three or four.

In the subglobular specimen from Naples just referred to, the ovarium is in a separate protoplasmic network, with large nucleated ova, and this network of various shapes is distinctly outlined. The ovarium is close to the base of the cœcum, and at first has only comparatively small ova, or rather embryonic cells (Pl. 20. fig. 8, and the upper part of figs. 9 & 10). The growth of the ovarium in this species should be carefully compared with that of *Hornera lichenoides* and other Cyclostomata. A comparison of Braem's* figure of the ovarium of *Plumatella fungosa* shows great similarity with that of *A. gelatinosum*.

* "Die geschlechtliche Entwicklung von *Plumatella fungosa*," Zoologica, Heft 23 (1897), pl. 2. fig. 54.

Loc. Spitzbergen; Greenland; Novaya Zemlya; Kara Sea; Jan Mayen; Barents Sea; White Sea; lat. 77° 55' N., long. 51° 02' E. (*Ridley*); Murman and Matochkin Shar (*Stuxberg*); lat. 76° 24' N., long. 62° 34' E., 170 metres (*Marenzeller*); Scandinavia; Queen Charlotte Island; Alaska (*Robertson*); British and French coasts; Adriatic (*Hincks*); Natal (*H.*).

Jackson-Harmsworth Exp.: off Cape Gertrude, about 30 fath., the stalked and the lobed form; Günther Sound, 10 fath., the stalked form; Cape Flora, off West Bay, 8 fath., lobed form; $\frac{2}{3}$ mile S.W. of Elmwood, 18 fath., lobed form; N. Wilczek Land, 127 fath., stalked form; off Cape Mary Harmsworth, 53-93 fath., lobed form; lat. 77° 55' N., long. 53° 20' E., 130 fath., stalked form.

LOXOSOMA SINGULARE, *Keferstein*.

Loxosoma singulare, Keferstein, *Zeitsch. f. wissensch. Zool.* xii. p. 13, pl. 11. fig. 29; for other references see Miss Jelly's Catalogue and Hincks, *Ann. Mag. Nat. Hist.* ser. 5, vol. vi. p. 276; Harner, *Quart. Journ. Micr. Sci.*, n.s. xxv. 1885, p. 4; Jullien & Calvet, *Bryozoaires provenant des campagnes de l'Hirondelle*, 1903, p. 28, pl. 2. fig. 5.

There are a few specimens from 50 miles N.W. of Cape Mary Harmsworth growing upon *Diastopora intricaria*, Sm., from 234 fathoms; and *Loxosoma* does not seem to have been previously recorded from so great a depth.

The peduncle is about twice as long as the calyx and is wrinkled transversely; but the material was not sufficient for complete study.

Vigelius found the *L. Nitschei*, Vig., in material brought back by the 'Willem Barents' Expedition, and Levinsen records an undetermined species from the Kara Sea.

Loc. St. Vaast-de-la-Hougue; off Novaya Zemlya, 62 fathoms; Shetland; Naples; Newfoundland, 155 metres (*Jull. & Calv.*).

Jackson-Harmsworth Exp.: 50 miles N.W. of Cape Mary Harmsworth, 234 fathoms.

165	1	<i>Crista cornuta</i> , var. <i>geniculata</i> , M.-Ed.	Page.
165	2	" <i>eburneo-denticulata</i> , Sm.	
165	3	" <i>eburnea</i> (L.)	
166	4	<i>Idmona atlantica</i> , Forbes	
167	5	" <i>fenestrata</i> , Busk	
168	6	" <i>tunida</i> , Sm.	
168	7	<i>Hornera tichenoides</i> (Pontop.)	
171	8	<i>Diastopora obehia</i> , var. <i>arctica</i> , nov.	
173	9	" (<i>Reticulipora</i>) <i>intricaria</i> , Sm.	
176	10	<i>Stomatopora incrassata</i> , Sm.	
176	11	" sp.	
176	12	<i>Lichenopora verrucaria</i> (Linn.)	8 (H.)
177	13	" <i>crassiuscula</i> , Sm.	
178	14	<i>Cylindrocium dilatatum</i> , Hincks	
178	15	<i>Buskia nitens</i> , Alder	
179	16	<i>Alcyonidium gelatinosum</i> (L.)	
181	17	<i>Loxosoma singulare</i> , Kesterstein	
165			Tentacles.
165			No. 1 Station f.
165			No. 2. Wilczek.
165			No. 3. Lat. 77° N.
52-93		Cape Mary Harmsworth.	} No. 4
93-134			
			Greenland.
			Finland.
			Spitzbergen.
			Kara Sea.
			Noraya Zemlya and Barents Sea.
			Labrador and Gulf of St. Lawrence.
			Jan Mayen.
			British.
			Mediterranean.

† The divisions are explained in the first part of this paper, Vol. xxviii. p. 47.

EXPLANATION OF THE PLATES.

PLATE 19.

- Fig. 1. *Diastopora intricaria*, Smitt. Dorsal surface of the zoarium. The shape of a lamina is seen at the right-hand side, as it is partly turned sideways. Natural size. From off glacier between Cape Flora and Cape Gertrude, about 30 fathoms. (*ov*) ovicell.
2. Do. ; natural size. Two laminae. From lat. $77^{\circ} 55' N.$, long. $55^{\circ} 25' E.$
 3. Do. ; natural size. End of branch, corresponding in shape with Cretaceous fossils figured by d'Orbigny.
 4. Do. Dorsal surface, $\times 12$. The ovicell is seen from the side, and to the left there is the extremity of a young lateral branch. From 50 miles N.W. of Cape Mary Harmsworth, 234 fathoms; Aug. 8th, 1897.
 5. Do. Anterior edge of a lamina, showing the length of the zoecial tubes, which extend at right angles to the two surfaces, $\times 12$. Same colony as fig. 4.
 6. Do. Ovicell with one oeciostome, and at the upper part of the ovicell the base of a lateral branch is enclosed, $\times 12$. Off glacier between Cape Flora and Cape Gertrude, 30 fathoms; July 21st, 1897.
 7. Do. The end of a zoecium and of an adventitious tubule, both with closures. From the ovicell fig. 6. $\times 85$.
 8. Do. Showing the zoecia with perforated closures, and also the position of the adventitious tubules, $\times 25$.
 9. Do. Calcareous longitudinal section, showing the outer calcareous wall beyond the zoecia, $\times 25$.
 10. Do. Transverse section of the same colony as fig. 9, $\times 25$.
 11. Do. Section of lobe (*a*) of the ovicell fig. 12, $\times 85$. 50 miles N.W. of Cape Mary Harmsworth, 234 fathoms; Aug. 8th, 1897.
 12. Do. Section of ovicell, $\times 25$.
 13. Do. Calcareous section showing the irregular wavy position of the zoecial tubes, also showing small internal projections, $\times 25$.

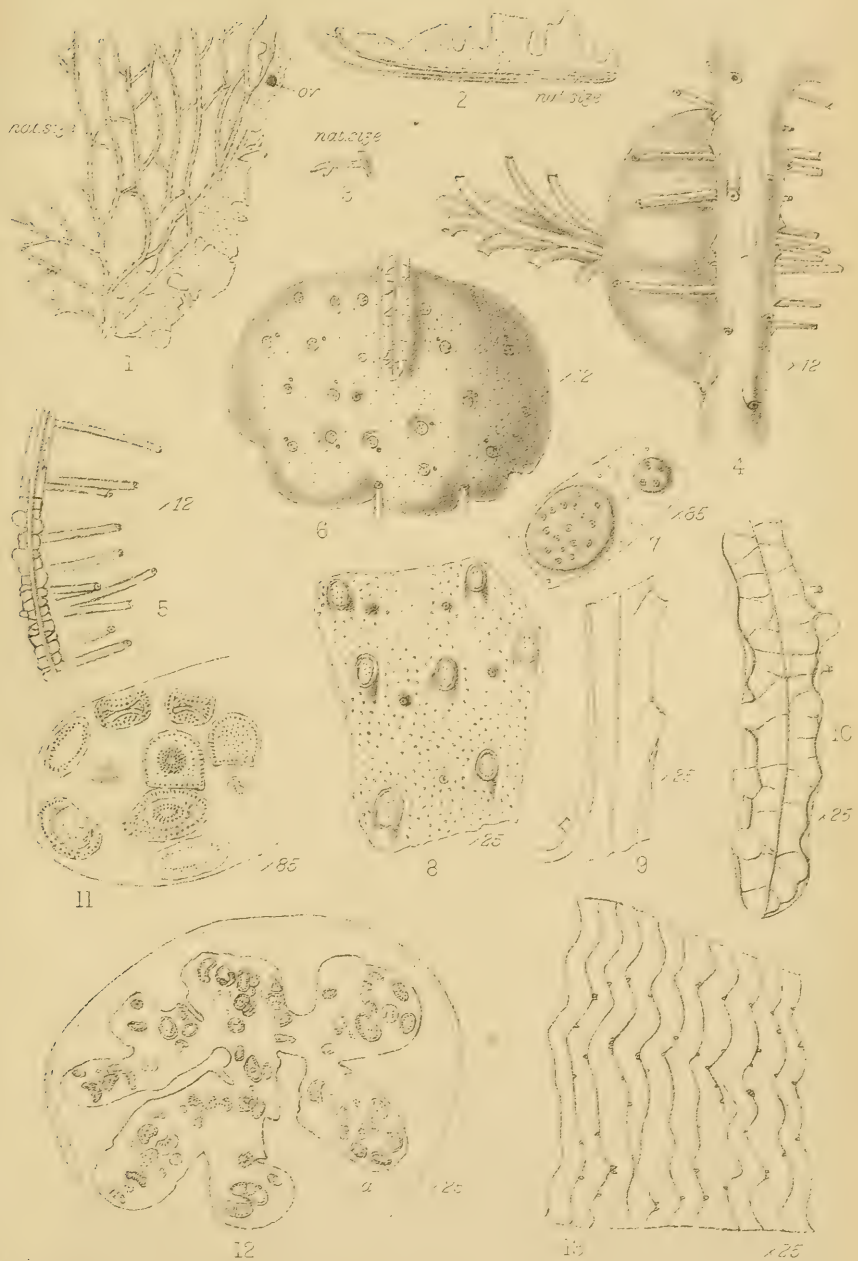
PLATE 20.

- Fig. 1. *Hornera lichenoides* (Pontop.), $\times 25$. Longitudinal section showing the polypides and the ovicell, surrounded by the wall (*w*), from which the reticulum (*r*) has separated, no doubt in consequence of the processes of preservation and preparation. In the reticulum, on the left-hand side, some ovarian masses are seen, and these are more magnified in fig. 4. Six embryos are seen in the section. From lat. $77^{\circ} 55' N.$, long. $55^{\circ} 25' E.$, 115 fathoms; July 8th, 1897.
2. Do. Transverse section of ovicell, $\times 25$. From lat. $77^{\circ} 55' N.$, long. $53^{\circ} 20' E.$, 130 fathoms; July 13th, 1897.
 3. Do. Section of embryo, $\times 85$. Whether the cilia on the upper part are in two tufts or are continuous is not clear.

- Fig. 4. *Hornera lichenoides*, L. Section of protoplasmic reticulum containing ovarian masses, $\times 450$. This reticulum is shown slightly magnified in fig. 1.
5. Do. Section of the wall of the ovicell, $\times 100$.
6. Do. Do., $\times 250$.
7. *Alcyonidium gelatinosum*, L. Ovarium showing three ova surrounded by the follicular walls, $\times 250$. From Cape Mary Harmsworth, 53-93 fathoms; Aug. 8th, 1897.
8. *Alcyonidium* sp. Younger end of the ovarium, $\times 250$. From Naples. This species corresponds in most particulars with *A. gelatinosum*, L.
9. Do. Young ovarium attached to the cæcum, $\times 250$.
10. Do. Ovarium in a distinct reticulum, $\times 85$.

PLATE 21.

- Fig. 1. *Diastopora obelia*, var. *arctica*, nov., $\times 25$. Showing the adventitious tubules and the ovicell. From $\frac{2}{3}$ of a mile S.W. of Elmwood, 18 fathoms; June 26th, 1897.
2. *Idmonea atlantica*, Forbes. Natural size.
3. Do. $\times 12$. Showing the ovicell. From lat. $77^{\circ} 55' N.$, long. $53^{\circ} 16' E.$, 150 fathoms; July 12th, 1897.
4. *Idmonea tumida*, Smitt, $\times 12$. From lat. $77^{\circ} 55' N.$, long. $53^{\circ} 16' E.$, 130 fathoms; July 13th, 1897.
5. Do. Natural size.
6. *Alcyonidium gelatinosum*, L. Section $\times 85$, showing the cuticula (*c*), the cuticula folded inwards at the oral aperture (*cf*). The layer of epithelial cells on the inside of the cuticula is shown as well as the endoderm lining the walls of the zoëcia. In the younger zoëcia divided off from the larger ones there are buds in various stages of growth. From North Wilczek Land.
7. Do. Section $\times 125$, showing the cuticula folded to the inside of the colony.
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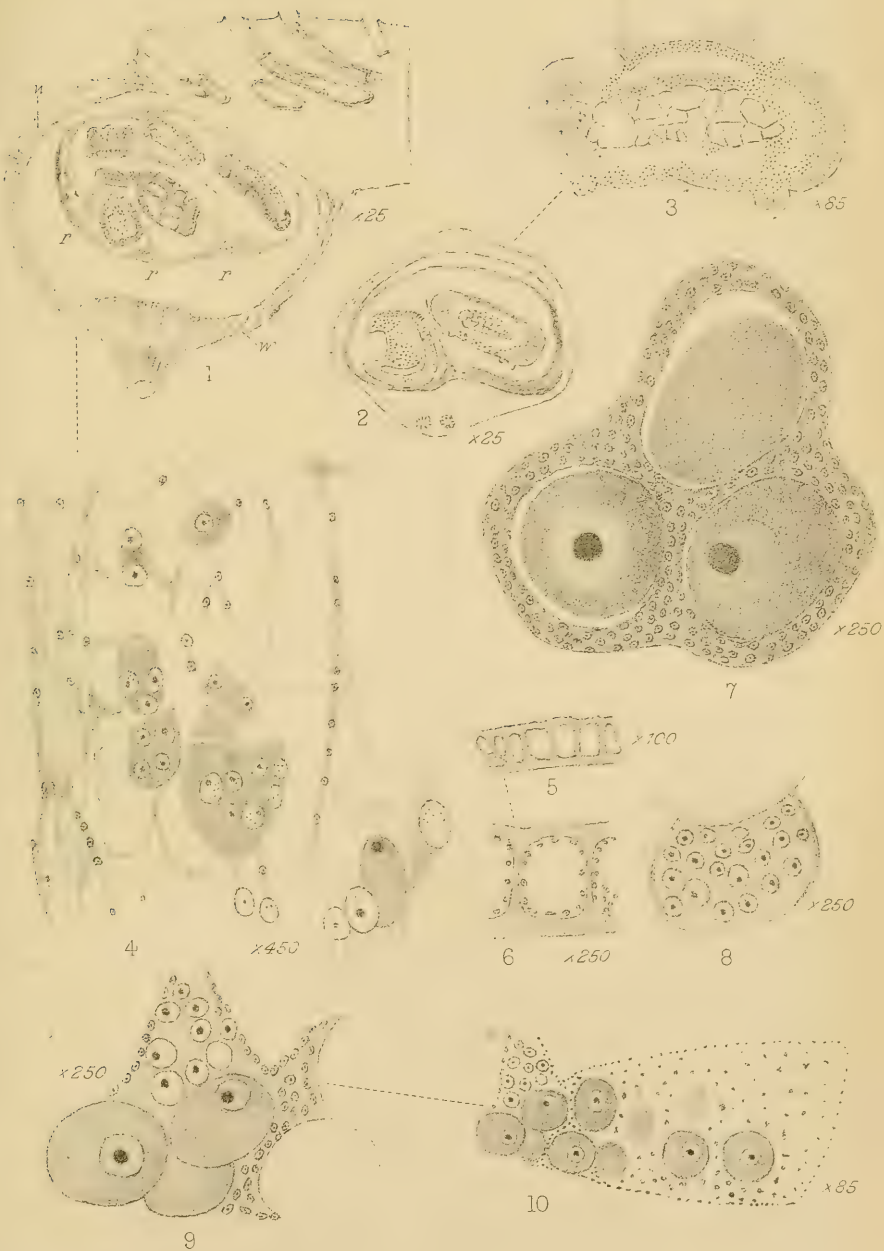


A. W. Waters del.

A. T. Hollick lith.

West, Newman imp. London.

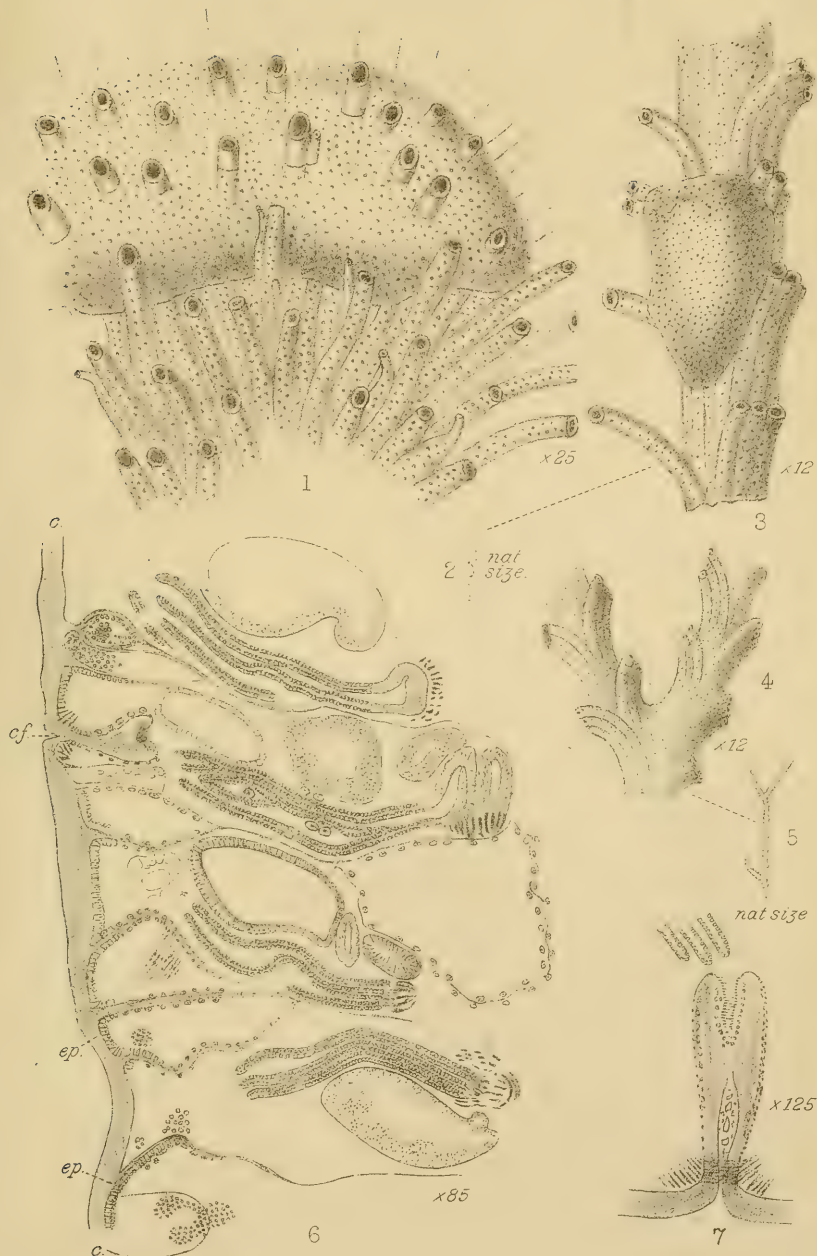
ARCTIC BRYOZOA.



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